

WHAT IS CLAIMED IS:

1. A DC-to-DC voltage converter operable from a DC voltage supply for providing a DC voltage to a load, the circuit comprising:
 - a. a differential oscillator, capable of being connected to such DC voltage supply and of producing a differential AC signal;
 - 5 b. a voltage rectifier having (i) an input port that receives the differential AC signal and (ii) a DC voltage output port; and
 - c. a start-up circuit, connected to the DC voltage output port and capable of limiting the voltage at the output port to a value sufficient to allow said differential oscillator to begin oscillating.
- 10 2. The DC-to-DC voltage converter of claim 1, wherein said start-up circuit comprises a voltage-limiting component.
3. The DC-to-DC voltage converter of claim 1, wherein said voltage-limiting component is
15 a diode.
4. The DC-to-DC voltage converter of claim 1, wherein said voltage rectifier is a diode rectifier.
- 20 5. The DC-to-DC voltage converter of claim 1, wherein said voltage rectifier is a synchronous rectifier.
6. The DC-to-DC voltage converter of claim 5, wherein:
 - a. said differential oscillator includes
 - 25 i. first and second inductors;
 - ii. a first oscillating transistor connected to said first inductor for coupling to such DC voltage supply, and
 - iii. a second oscillating transistor connected to said second inductor for coupling to such DC voltage supply,

- iv. wherein said first and second oscillating transistors are cross-coupled to each other such that an electrical oscillation results; and
- b. said voltage rectifier includes
 - i. a first rectifying transistor coupled to said first oscillating transistor, and
 - ii. a second rectifying transistor coupled to said second oscillating transistor,
 - 5 iii. wherein said first and second rectifying transistors are cross-coupled to each other such that said voltage rectifier operates synchronously with said differential oscillator.

10 7. The circuit of claim 6, wherein said first and second inductors are formed from two cross-coupled symmetrical interleaved conductors, such that even-order noise components generated by said differential oscillator substantially cancel at said DC output voltage port.

15 8. The circuit of claim 6, wherein the output voltage is greater in magnitude than the voltage supplied by such DC voltage supply and negative in polarity.

9. The circuit of claim 6, wherein at least one of said transistors is one of a MESFET, JFET, MOSFET, BJT, HBT, and PHEMT.

20 10. The circuit of claim 6, wherein said rectifying transistors are MESFETs.

11. A DC-to-DC converter circuit operable from a DC voltage supply for providing a DC voltage to a load, the circuit comprising:

- a. a differential oscillator, including
 - 25 i. first and second inductors,
 - ii. a first oscillating transistor connected to said first inductor for coupling to such DC voltage supply, and
 - iii. a second oscillating transistor connected to said second inductor for coupling to such DC voltage supply,

- iv. wherein said first and second oscillating transistors are cross-coupled to each other such that an electrical oscillation results; and
- b. a voltage rectifier, including
 - i. a first rectifying transistor coupled to said first oscillating transistor, and
 - ii. a second rectifying transistor coupled to said second oscillating transistor,
 - 5 iii. wherein said first and second rectifying transistors are cross-coupled to each other such that said voltage rectifier operates synchronously with said differential oscillator.

12. The circuit of claim 10, wherein said oscillating transistors are MESFETs.

13. A method of converting a first DC voltage to a second DC voltage, comprising the steps of:
- a. converting the first DC voltage into an oscillating differential voltage;
 - b. synchronously rectifying the oscillating differential voltage to produce the second DC voltage; and
 - 15 c. outputting the second DC voltage at an output port.

14. The method of claim 11, wherein:

- a. the oscillating differential voltage is a difference voltage formed by first and second branch oscillating voltages that are 180 degrees out-of-phase with each other, and
- b. the step of synchronously rectifying includes the steps of:
 - i. inputting the first branch oscillating voltage into the current-source terminal of a first transistor having a current-source terminal, a current-sink terminal, and a control terminal;
 - 25 ii. inputting the second branch oscillating voltage into the current-source terminal of a second transistor having a current-source terminal, a current-sink terminal, and a control terminal;

- iii. inputting a control signal to the control terminal of the first transistor, wherein the control signal causes the first transistor to operate synchronously with the first branch oscillating voltage;
- iv. inputting a control signal to the control terminal of the second transistor, wherein the control signal causes the second transistor to operate synchronously with the second branch oscillating voltage; and
- v. outputting first and second rectified voltages from the control-sink terminal of each of the first and second transistors.

15. A method of starting-up a DC/DC voltage converter comprising (i) a differential oscillator capable of receiving a supply voltage and (ii) a rectifier having an output port, comprising the steps of:
- a. voltage-limiting the voltage at the output port, and then
 - b. connecting the supply voltage to the differential oscillator.